



STP100NF04L

N-CHANNEL 40V - 0.0036 Ω - 100A TO-220
STripFET™ II POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-------------|------------------|---------------------|----------------|
| STP100NF04L | 40 V | <0.0042 Ω | 100 A |

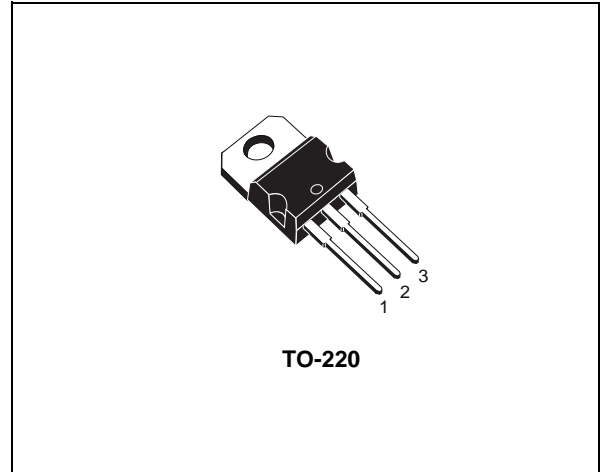
- TYPICAL R_{DS(on)} = 0.0036 Ω
- LOW THRESHOLD DRIVE
- 100% AVALANCHE TESTED
- LOGIC LEVEL DEVICE

DESCRIPTION

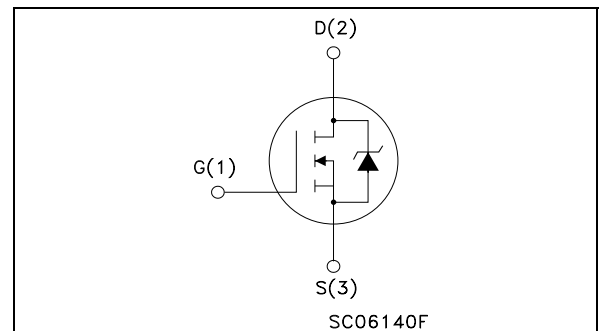
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- SOLENOID AND RELAY DRIVERS



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 40 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 k Ω) | 40 | V |
| V _{GS} | Gate- source Voltage | ± 16 | V |
| I _D (*) | Drain Current (continuous) at T _C = 25°C | 100 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 70 | A |
| I _{DM} (•) | Drain Current (pulsed) | 400 | A |
| P _{tot} | Total Dissipation at T _C = 25°C | 300 | W |
| | Derating Factor | 2 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 3.6 | V/ns |
| E _{AS} (2) | Single Pulse Avalanche Energy | 1.4 | J |
| T _{stg} | Storage Temperature | -65 to 175 | °C |
| T _j | Max. Operating Junction Temperature | 175 | °C |

(•) Pulse width limited by safe operating area.
(*) Current Limited by package

(1) I_{SD} ≤ 100A, di/dt ≤ 240A/μs, V_{DD} ≤ 32V, T_j ≤ T_{JMAX}
(2) Starting T_j = 25 °C, I_{AR} = 50A, V_{DD} = 30V

THERMAL DATA

| | | | | |
|-----------------------|--|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 0.5 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |
| T _j | Maximum Lead Temperature For Soldering Purpose | Typ | 300 | °C |

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)**OFF**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|---|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 µA, V _{GS} = 0 | 40 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating T _C = 125°C | | | 1 10 | µA µA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ± 16 V | | | ±100 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---|------|------------------|------------------|--------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} I _D = 250 µA | 1 | | | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V I _D = 50 A V _{GS} = 4.5 V I _D = 50 A | | 0.0036 0.0040 | 0.0042 0.0065 | Ω Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|---|---|------|---------------------|------|----------------|
| g _{fs} (*) | Forward Transconductance | V _{DS} = 15 V I _D = 20 A | | 50 | | S |
| C _{iss} C _{oss} C _{rss} | Input Capacitance Output Capacitance Reverse Transfer Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 6400 1300 190 | | pF pF pF |

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|---|------|------------------|------|----------------|
| $t_{d(on)}$ t_r | Turn-on Delay Time Rise Time | $V_{DD} = 20\text{ V}$ $I_D = 50\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3) | | 37 270 | | ns ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 32\text{ V}$ $I_D = 100\text{ A}$ $V_{GS} = 4.5\text{ V}$ | | 72 20 28.5 | 90 | nC nC nC |

SWITCHING OFF

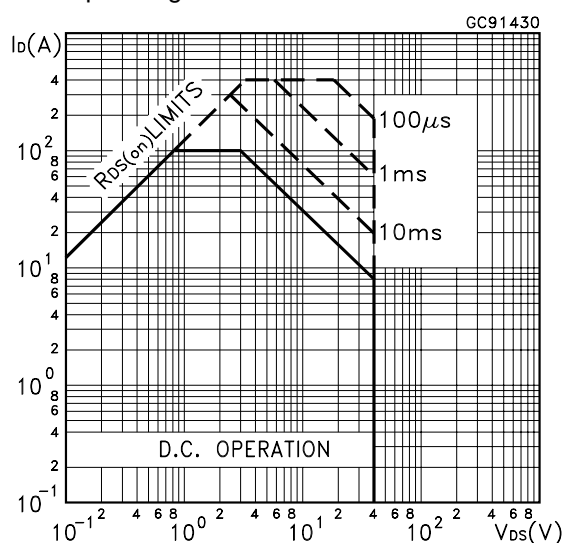
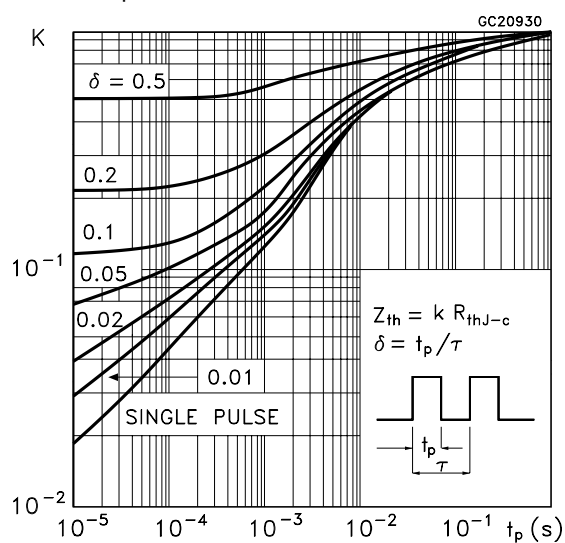
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|---|---|------|------------------|------|----------------|
| $t_{d(off)}$ t_f | Turn-off Delay Time Fall Time | $V_{DD} = 20\text{ V}$ $I_D = 50\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3) | | 90 80 | | ns ns |
| $t_r(V_{off})$ t_f t_c | Off-voltage Rise Time Fall Time Cross-over Time | $V_{clamp} = 32\text{ V}$ $I_D = 100\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\text{ V}$ (Inductive Load, Figure 5) | | 85 125 160 | | ns ns ns |

SOURCE DRAIN DIODE

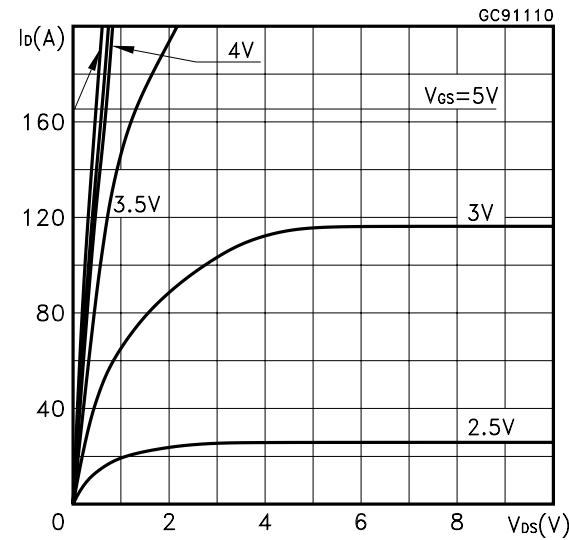
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|------------------|------------|---------------|
| I_{SD} $I_{SDM}(\bullet)$ | Source-drain Current Source-drain Current (pulsed) | | | | 100 400 | A A |
| $V_{SD}(\ast)$ | Forward On Voltage | $I_{SD} = 100\text{ A}$ $V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 100\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5) | | 88 240 5.5 | | ns nC A |

(\ast) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

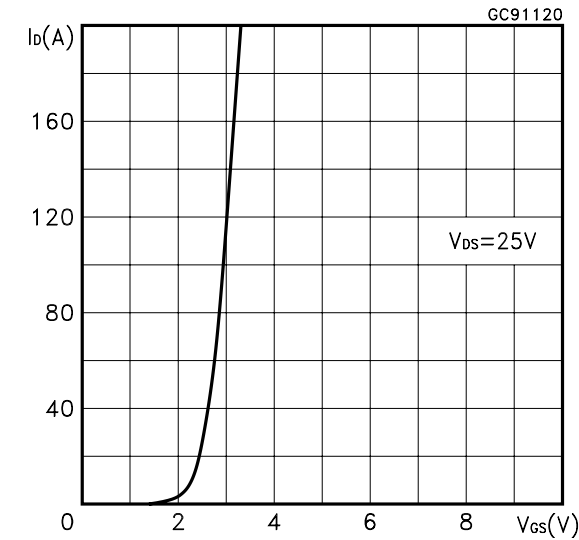
(\bullet) Pulse width limited by safe operating area.

Safe Operating Area**Thermal Impedance**

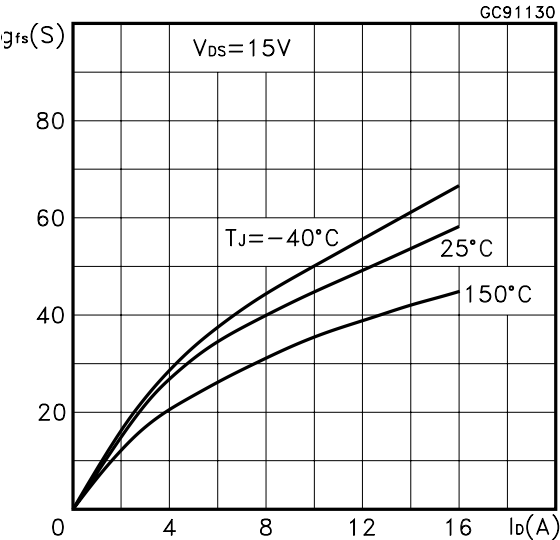
Output Characteristics



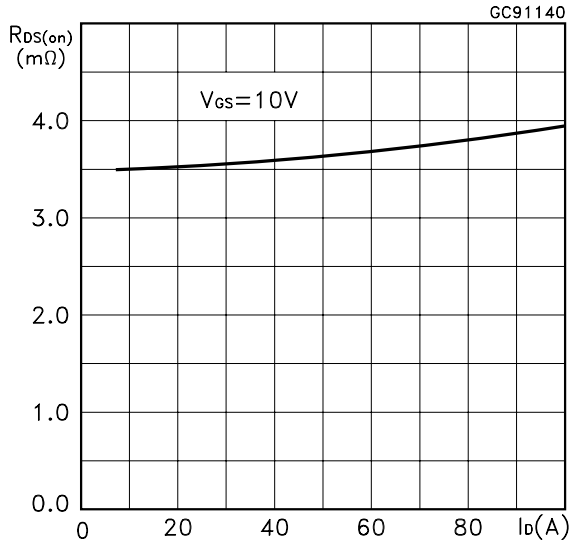
Transfer Characteristics



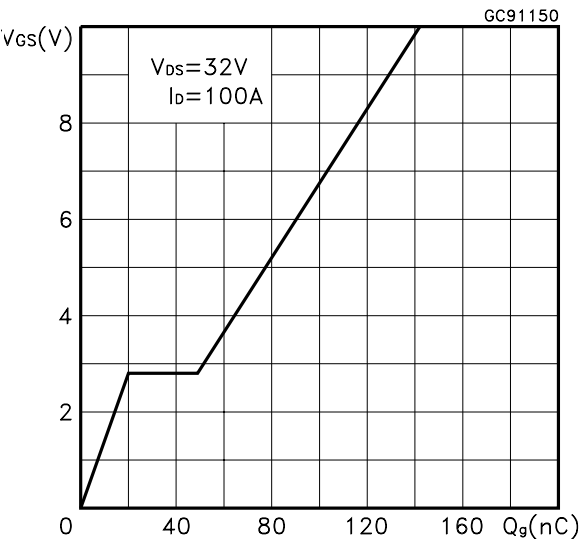
Transconductance



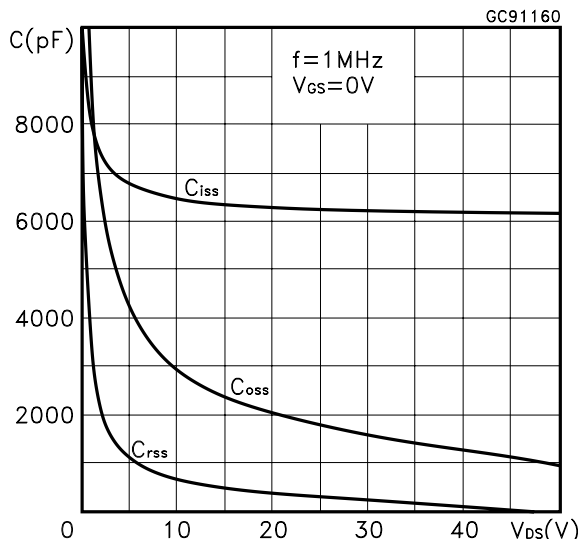
Static Drain-source On Resistance



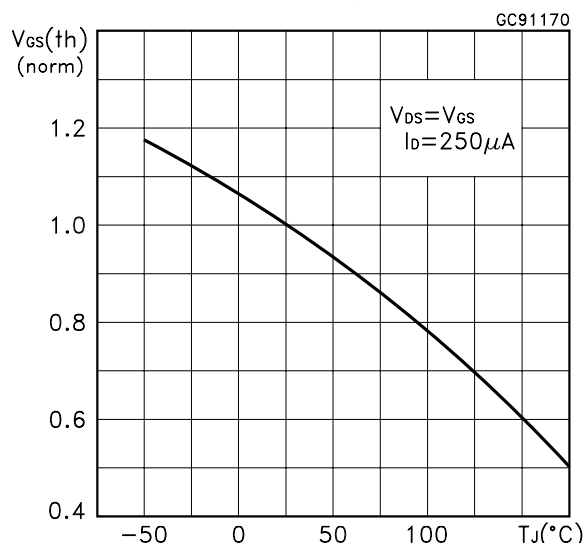
Gate Charge vs Gate-source Voltage



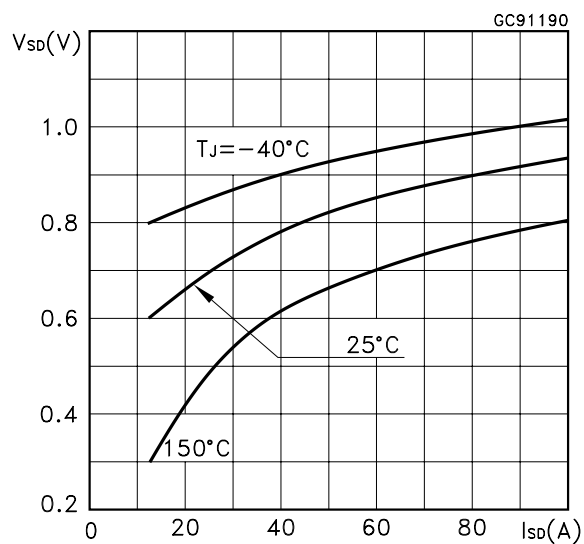
Capacitance Variations



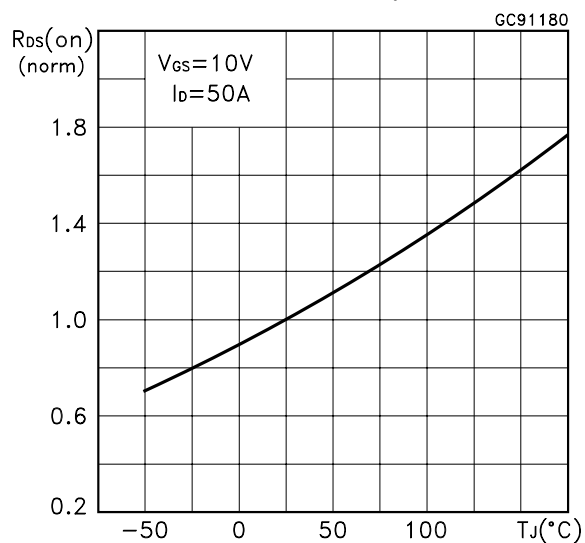
Normalized Gate Threshold Voltage vs Temperature



Source-drain Diode Forward Characteristics



Normalized on Resistance vs Temperature



Normalized Breakdown Voltage Temperature.

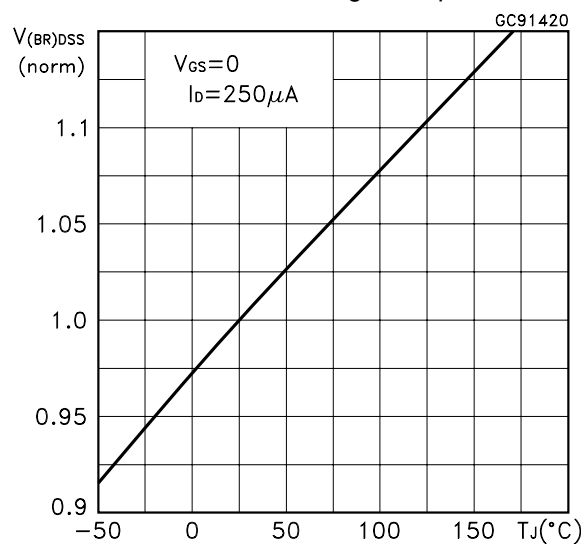
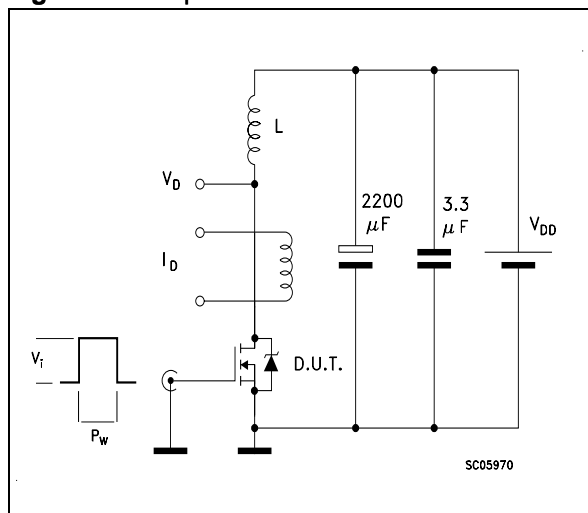
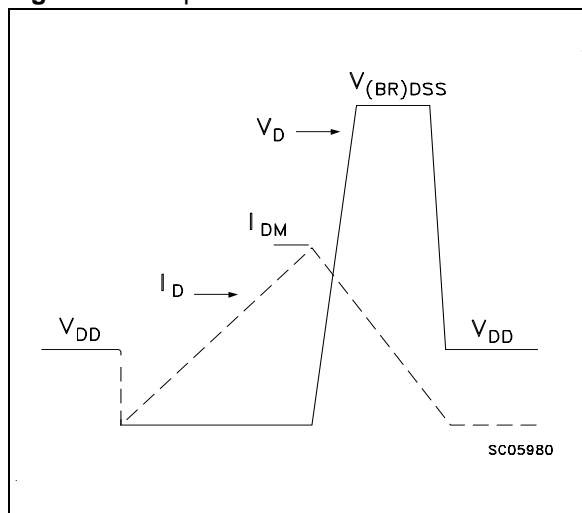
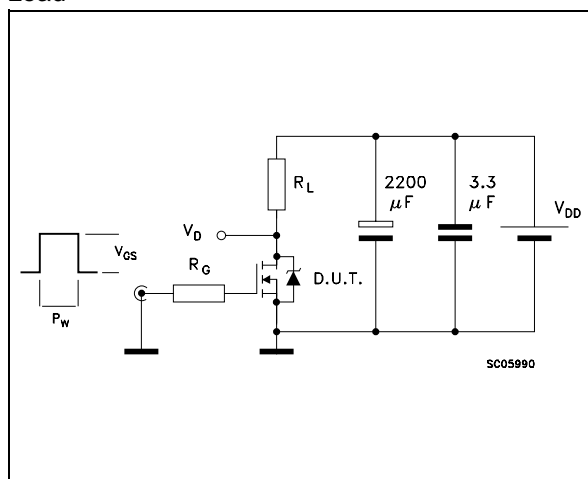
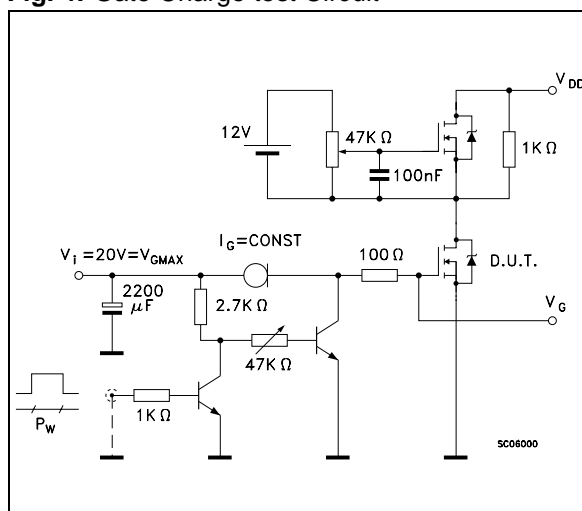
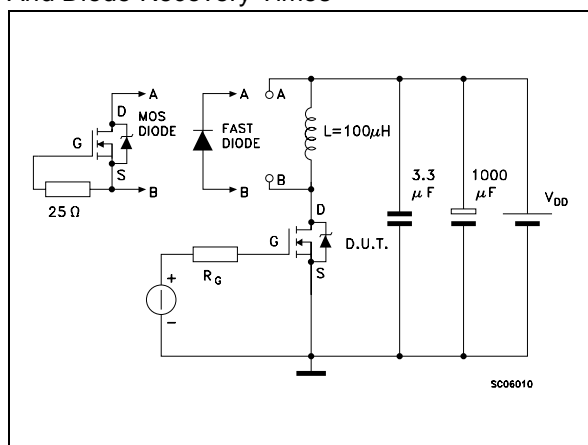
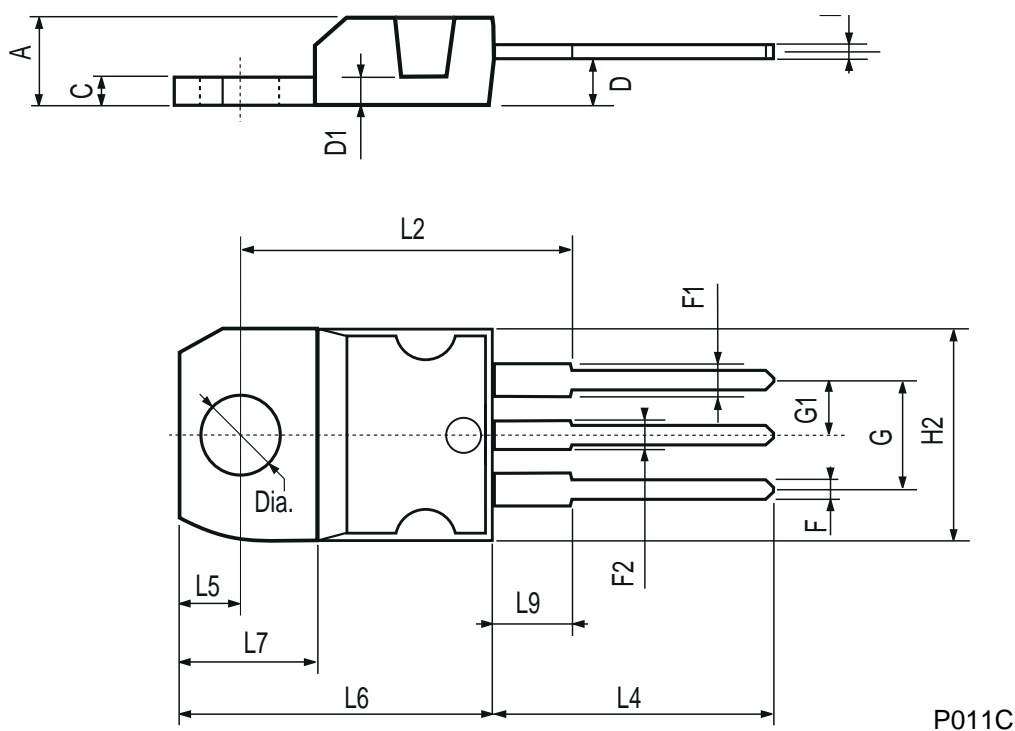


Fig. 1: Unclamped Inductive Load Test Circuit**Fig. 2: Unclamped Inductive Waveform****Fig. 3: Switching Times Test Circuits For Resistive Load****Fig. 4: Gate Charge test Circuit****Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**

TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



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